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<p>(21) International Application Number: PCT/GB98/00620 (22) International Filing Date: 13 March 1998 (13.03.98) (30) Priority Data: 9705363.1 14 March 1997 (14.03.97) GB (71) Applicant (for all designated States except US): DEFENSE TECHNOLOGY CORPORATION OF AMERICA [US/US]; 1900 North Casper Loop, Casper, WY 82601 (US). (72) Inventor; and (75) Inventor/Applicant (for US only): SAXBY, Michael, Ernest [GB/GB]; 82 Cowdray Park Road, Little Common, Bexhill-on-Sea, East Sussex TN39 4EZ (GB). (74) Agents: HUTCHINS, Michael, Richard et al.; Fry Heath & Spence, The Old College, 53 High Street, Horley, Surrey RH6 7BN (GB).</p>		<p>(81) Designated States: CA, GB, US, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</p>
<p>(54) Title: IMPROVEMENTS RELATING TO PYROTECHNIC AMMUNITION</p> <div data-bbox="316 1102 1339 1501"> </div> <p>(57) Abstract</p> <p>A cartridge comprising a casing (1) having a passage extending therethrough, said passage having a larger diameter rearward section (7) and a smaller diameter forward section (9). A core member is slidably received in the passage, and has a forwardly facing piston surface (21) and a portion (19) closing the forward length of passage in the unactivated condition of the cartridge. A cavity (23) within the core member receives propellant gas from a primer (25) and discharges the gas into the passage forwardly of the piston surface. The core is propelled rearwardly and releases propellant gas into the forward passage section.</p>		

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IMPROVEMENTS RELATING TO PYROTECHNIC AMMUNITION

European patent specification EP 473 758 relates to non-lethal pyrotechnic ammunition for training and war games. A cartridge disclosed in this earlier specification includes a casing slidable relative to a plug at the forward end of the cartridge. When the cartridge is fired, force provided by the propellant gas is employed to urge the casing back against the breech-block and recycle the weapon.

This known cartridge is charged with a small quantity of propellant in addition to that contained in a primer. In order to achieve the objective of the cartridge, the propellant gas is fed through relatively constricted passages and galleries. Filling and machining tolerances mean that variations often occur in the weight of the additional propellant, and in flow rates through the passages and galleries, and lead to unreliable performance.

This problem is overcome by the cartridge herein proposed, which will now be described with reference to the accompanying drawings, in which:

Figure 1 is an axial section through a round of ammunition which incorporates the proposed cartridge, showing the round in position within the barrel of a gun, before firing,

Figure 2 is a view similar to Figure 1, showing the parts of the cartridge in the positions they occupy immediately after ignition of the primer,

Figure 3 is a view similar to Figure 1, showing the

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parts of the cartridge in the positions they occupy immediately after the ejection of the projectile.

Referring to Figure 1 of the drawing, a round of ammunition includes a cartridge 1 and a projectile 3 in the form of a taper lock bullet. The round is depicted in the chamber of a firearm having a barrel A, breech block B and firing pin C, all shown schematically.

- 10 The cartridge includes a casing 5 having an external shape which conforms to the chamber. The casing is in the form of a hollow component through which extends a passage of circular cross-section having a large diameter rearward section 7, a narrowed intermediate
- 15 section 9, and a tapered forward section 11 which receives the trailing end of the projectile. A frusto-conical transition surface 13 extends between the passage sections 7 and 9.
- 20 Inserted into the casing 5 from its rear end is a core 15 having a hollow rearward portion 17 and a solid forward portion 19 joined by an intermediate portion 21. The portions 17 and 19 are shaped externally so as to be a sliding fit in the passage sections 7 and 9 and the
- 25 intermediate portion 21 is complementary to the transition surface 13. The portion 19 serves substantially to block the passage section 9 against escape of gas therethrough.
- 30 Within the rearward body portion 17 of the core is a chamber 23 which is enlarged at its rearward end to receive an explosive primer 25. Passing through the intermediate body portion 21 is a plurality of obliquely outwardly radiating bores 27, conveniently three or four
- 35 in number. The outer ends of the bores 27 face the

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transition surface 13.

The chamber 23 serves as, and will be referred to herein as, the first expansion chamber.

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When the firearm is fired, the firing pin C strikes the primer 25, which explodes and discharges propellant gas into the first expansion chamber 23. The gas passes through the passages 27 into the space defined between the intermediate portion 21 and transition surface 13 of the bore. The outer surface of the intermediate portion 21 serves as a piston, so that the gas forces the core 5 towards the rear, to create a second expansion chamber 29, as shown in Figure 2. During this action, the forward core portion 19 is withdrawn through the passage section 7. Rearward movement of the core 15 ceases when a retaining and seal ring 31 at the rear of the passage section 7 engages a stop surface 33 at the forward end of the rearward body portion 17, as shown in Figure 3. Contact between the seal ring and the surface of the rearward body portion 17 prevents escape of gas to the rear during the operation of the cartridge described above. During this sequence of operations, upon complete withdrawal of the forward core part 19 from the forward passage section 11, the gas in the second expansion chamber 29 is dumped instantaneously into the passage sections 9 and 11 to expel the projectile.

The rearward movement of the core applies force to the breech block to recycle the weapon.

Because the operation of the proposed cartridge does not depend upon the use of propellant additional to that provided by primer 25, and ejection of the projectile takes place in response to the opening of passage

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section 9 and substantially instantaneous dumping of gas into that passage, the proposed cartridge does not suffer from the tendency towards unreliable operation which characterises the cartridge known from EP 473 758.

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Because the proposed cartridge does not have the fine passages of the known cartridge, at least the core is especially suited to moulding from plastics.

10 The cartridge may also be reused by replacing the primer or, alternatively, replacing the core and primer assembly. The proposed cartridge is also less toxic than the known cartridge because no additional propellant is required.

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The cartridge may be used as a blank if the projectile is omitted.

20 Although the transition surface is shown to be frusto-conical, and the outer surface of the intermediate portion 21 complementary thereto, it is possible for and least the outer surface of the intermediate portion 21 to extend radially, provided that bores 27 are suitably arranged to feed gas into the second expansion chamber

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CLAIMS

1. A cartridge comprising a casing having a passage extending therethrough, said passage having a larger diameter rearward section and a smaller diameter forward section, a core member disposed in the passage, the core member having a portion slidably received in and blocking the forward passage section in the unactivated condition of the cartridge, the core member having a forward facing piston surface disposed in the rearward passage section, a cavity within the core member for receiving propellant gas from a primer and discharging said gas into the passage forwardly of the piston surface, thereby to propel the core member rearwardly to uncover and release propellant gas into the forward passage section.
2. A cartridge comprising a hollow casing formed with a stepped passage therethrough, the passage having a rearward larger diameter section and a forward smaller diameter section, a core member slidably received within said passage and having a portion closing the forward passage section, the core member having defined therein a first expansion chamber to receive propellant gas from a primer, at least one outlet opening from said chamber into the passage rearwardly of the step to allow gas to flow from the first expansion chamber into a second expansion chamber defined between the core and passage rearwardly of the step, whereby propellant gas serves to retract the core member to open the forward passage section and allow gas to flow therethrough.
3. A method of recycling a firearm, wherein propellant gas flowing from a chamber within a cartridge core member is used to cause the core member to retract

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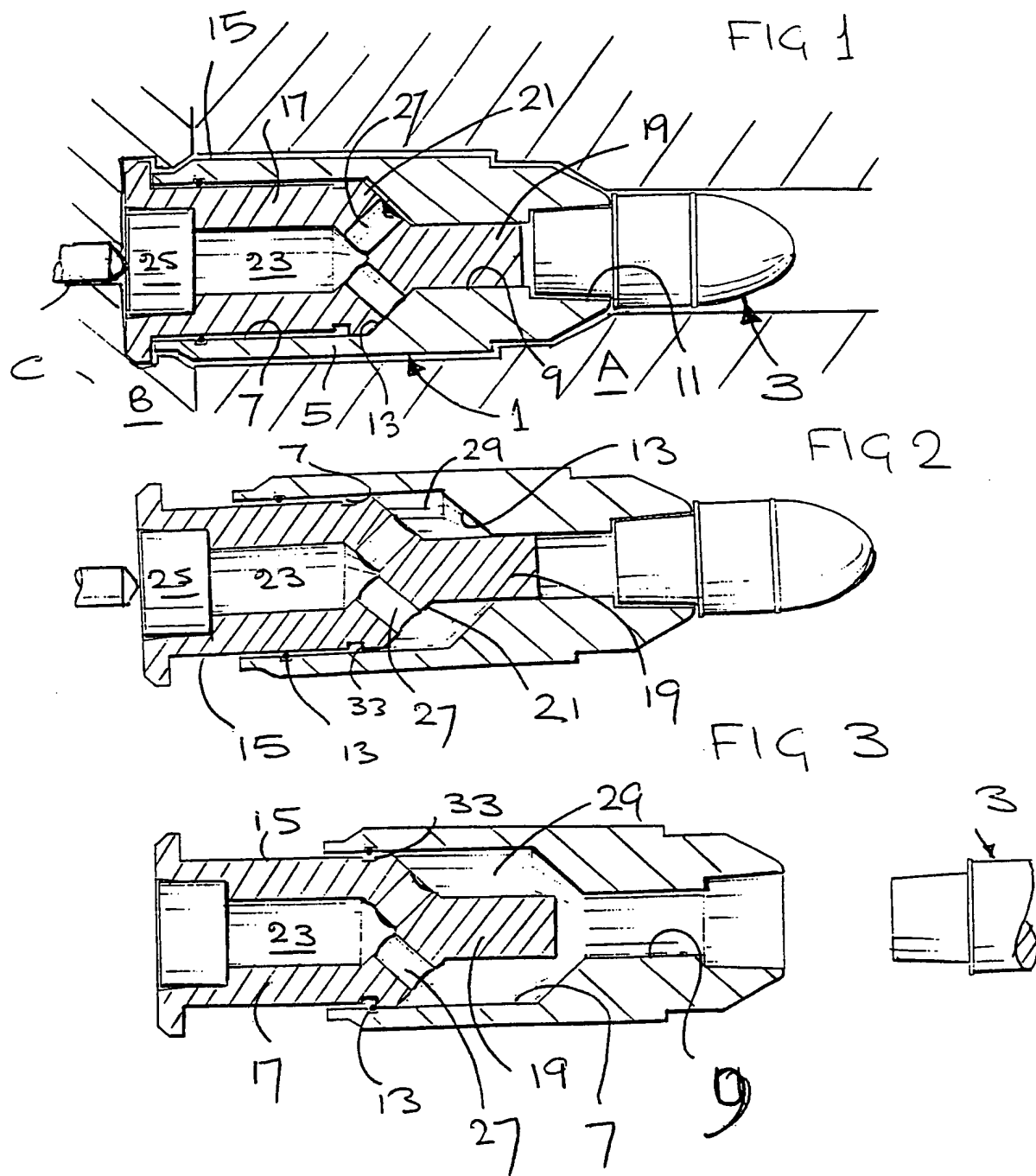
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relative to a casing and expose the inlet to a forward
passage section of the casing, a projectile being
received in the said forward section or an extension
thereof and being expelled by said gas, the retraction
5 of the core member serving to recycle the firearm.

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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 F42B5/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 F42B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 686 905 A (SZABO ATTILA) 18 August 1987 see column 3, line 36-60; figures 12-14 see column 5, line 34-54	1-3
X	WO 95 05573 A (SAXBY MICHAEL ERNEST) 23 February 1995 see page 4, line 13 - page 6, line 12; figures 1-3	3
A	WO 91 14916 A (SNC IND TECHNOLOGIES INC) 3 October 1991 cited in the application see column 2, line 49 - column 3, line 48; figure 4	3
A	US 3 477 375 A (BARR IRWIN R) 11 November 1969	

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4686905 A	18-08-1987	NONE	
WO 9505573 A	23-02-1995	GB 2281118 A	22-02-1995
		AU 682708 B	16-10-1997
		AU 7388294 A	14-03-1995
		CA 2169565 A	23-02-1995
		CN 1132553 A	02-10-1996
		EP 0775288 A	28-05-1997
		JP 10503275 T	24-03-1998
		US 5700972 A	23-12-1997
		ZA 9406159 A	29-03-1995
WO 9114916 A	03-10-1991	AT 113120 T	15-11-1994
		AU 653716 B	13-10-1994
		AU 7476791 A	21-10-1991
		CN 1055811 A, B	30-10-1991
		DE 69104677 D	24-11-1994
		DK 473758 T	10-04-1995
		EP 0473758 A	11-03-1992
		ES 2065682 T	16-02-1995
		IL 97632 A	30-05-1994
		JP 5502933 T	20-05-1993
		KR 9701770 B	15-02-1997
		NO 175022 B	09-05-1994
		TR 25753 A	01-09-1993
		US 5492063 A	20-02-1996
		US 5677505 A	14-10-1997
		US 5359937 A	01-11-1994
US 3477375 A	11-11-1969	NONE	